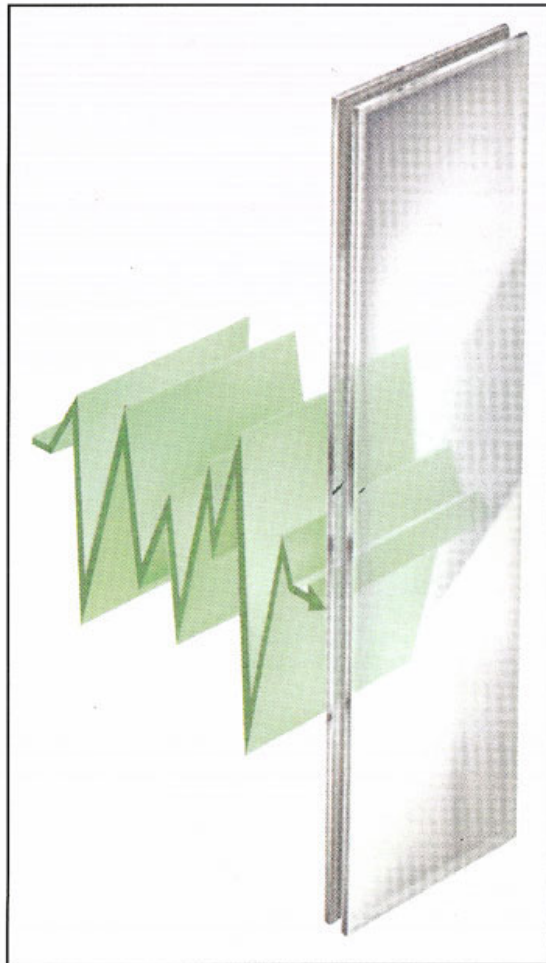




PILKINGTON

DATA STOP

SHIELDING AGAINST ELECTROMAGNETIC
RADIATION



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INTRODUCTION

The reliance of Industry and Commerce on computer information and control systems is well established and the security of such systems is vital. It has, therefore, become necessary to safeguard information held on computers, word processors and the like from either unwanted interrogation, interference from outside or accidental loss due to extraneous electronic 'noise'.

Pilkington Architectural has developed (patent applied for) a range of 'Datastop' glasses - both laminates and sealed units, which have been specifically designed to reduce the transmission of electromagnetic radiation. They can be used as windows or glazed panels in shielded external walls, internal partitions or cubicles designed to provide good attenuation using the Faraday Cage Principle. NOTE: A Faraday Cage is an enclosure, all of whose (external) surfaces are electrically conducting.

For maximum attenuation the special coatings 'Datastop' glass must be conductively connected to the window frame all around its periphery, which in turn should be connected to the wall screening of such enclosure.

The glass provides good clear vision and light transmission. Such an enclosure or screened room will require air conditioning and a major advantage of the 'Datastop' double glazed range is their inherent very high solar heat rejection and exceptional thermal insulation.

ADVANTAGES

- Good electrical attenuation over a wide range of frequencies.
- Good optical clarity.
- Easy edge connection methods.
- High impact resistance.
- Good light transmission.
- Low solar heat transmission.
- Very high thermal insulation.
- Available in large sizes.
- Choice of colors.
- No obstructive mesh.

DESCRIPTION

Several 'Datastop' Glass types are available, supplied as laminates or as sealed double glazing units, all assembled from specially formulated coated glasses where the coatings have been optimized to ensure the best compromise between shielding performance and optical clarity.

The products are distinguished by the codes L or D followed by a number which gives the approximate attenuation at 1000 MHz.

L = Laminated Glass

D = Insulight sealed double glazing unit eg. L60 indicates Laminated 'Datastop' with approximate attenuation of 60 dB at 1000 MHz.

Single Glass

Laminated - Suitable for internal use. Can also be used as secondary sash reglazing, please inquire.

Normal Thickness - 6.4 mm (1/4")
Weight - 15 kg/m² (3 lb / ft²)

Double Glazed Unit

Suitable for both external and internal use.

Weight - 30 kg/m² (6 lb / ft²)
Standard Configuration - 6mm (1/4") outer glass (annealed)
- 12 mm (1/2") air space
- 6mm (1/4") inner glass (annealed)
Safety glass is available on request.

TECHNICAL DESCRIPTION

Shielding Properties

The signal attenuation of 'Datastop' Glass is achieved by the use of several layers of specially developed coatings which are effective in the electrical field by reflection of the signal. The attenuation provided will depend on the characteristics of the signal, and the electrical connection at the glass edge.

The attenuations for the various 'Datastop' glasses are given in Figures 1 and 2.

The unit of attenuation is a logarithmic one, the decibel (dB). The graph in Figure 3 shows the relationship between decibels and the percentage attenuation (reduction) in the electric field.

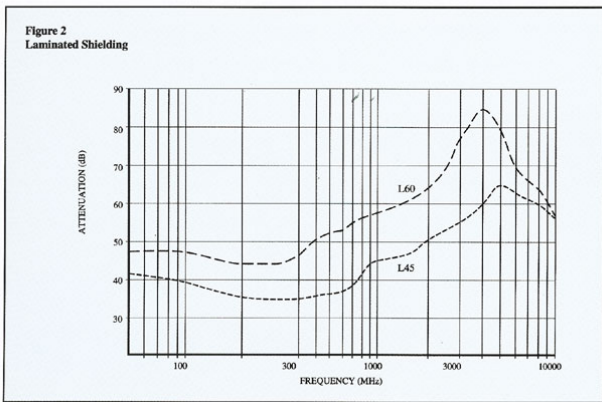
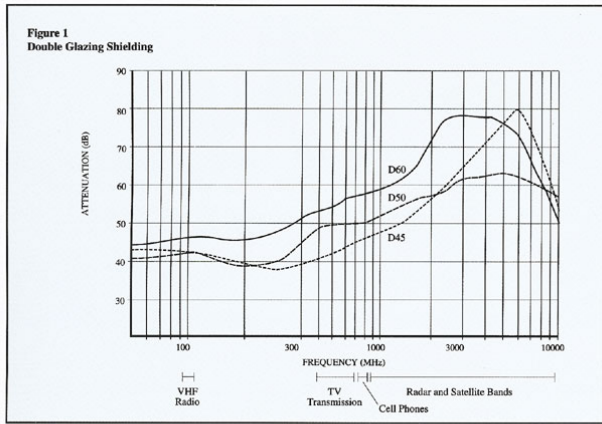
The attenuation performance was measured using a test sample of approximately 1m² inserted in the wall of a 2.5m cube screened room frequencies up to 1GHz (1000 MHz). For frequencies above 1GHz a 1 meter cube screen enclosure was used.

This method is based on the specification in US Military Standard MIL-STD-285C and consists of measuring the transmission between two aerials 2 meters apart. The attenuation of the glass is measured by comparing the transmission through the glass when glazed in the screened room, with the signal strength in open field conditions. (See Figure 4)

Optical Properties

The complete optical properties of the laminated and sealed unit versions have been measured using standard techniques and the results for the wide choice of colors available are shown in Figure 5.

Screened rooms and buildings will require a sealed facade thus necessitating air conditioning. This table gives the excellent light/heat ratios showing that the D range can reject up to 78% of the solar heat and at the same time provide thermal insulation better than any product in the Pilkington range.



GLAZING & MAINTENANCE

In order to maximize the screening effect of the whole building it is essential that the total periphery of the glass is electronically connected to the metal window frame which in turn should be connected to the screening material in the wall. See Figures 6 and 7.

After installation an initial 'audit' is recommended to measure the attenuation of the total screening. This should be repeated periodically.

As with all double glazing units, 'Datastop' units for external glazing should be installed in accordance with good practice, and following the recommendations in the leaflet 'Insulight' double glazing units - Installation and Maintenance.

HANDLING & STORAGE

Double glazing units incorporating Pilkington 'Datastop' glass should be handled with care to avoid damage to the glass or edge seal. They should be unpacked on receipt and any units found to be wet must be dried. All units must be stored on edge in dry ventilated conditions, out of direct sunlight.

For further details on the storage and handling of double glazing units refer to the Pilkington Publication 'Insulight' Double Glazing Units - Installation and Maintenance.

APPLICATIONS

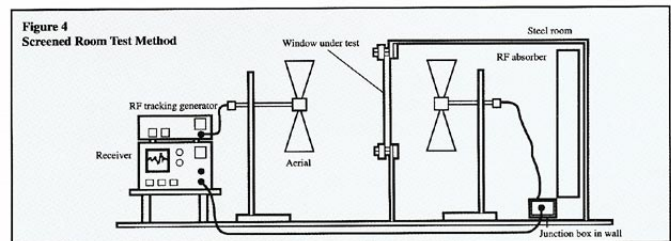
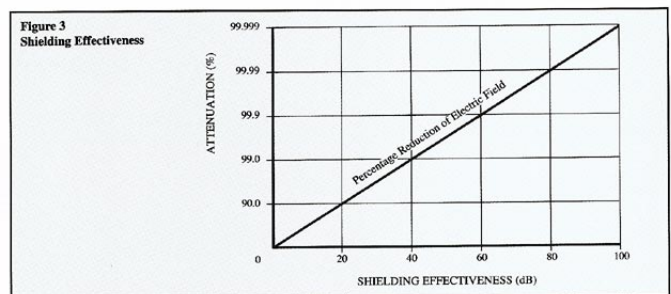
Pilkington 'Datastop' Glass(s) can be used whenever a window or viewing panel is required in a screened enclosure offering protection from electronic interference.

Typical enclosures would include screened cubicles, partitioned rooms, or totally shielded offices.

For cubicles and partitions the laminated (L) versions are recommended while for external glazing the sealed unit (D) versions should be used.

When offices are being refurbished for electromagnetic control purposes, the window can be replaced, or alternatively a single piece secondary sash can be installed using laminated or double glazed 'Datastop'.

For new office complexes incorporating computer facilities and terminals the complete glass curtain wall can now be screened using Pilkington 'Datastop'. The advantage of discussing such screening methods at the design stage cannot be overstressed, since there is now the option for, screening the complete building envelope incorporating excellent solar control and thermal insulation as necessary in air conditioned buildings. OEM applications include monitor and instrument screens.



Code	Colour from Outside	Light		Solar Radiant Heat			Total Transmittance	Total Shading Coefficient	U value (W/m ² K)
		Transmittance	Reflectance	Direct Transmittance	Reflectance	Absorptance			
D60	Gold	0.45	0.35	0.19	0.40	0.41	0.29	0.33	1.35
D50	Neutral	0.68	0.17	0.39	0.20	0.41	0.52	0.60	1.40
D45	Grey	0.23	0.11	0.11	0.16	0.73	0.21	0.24	1.35
	Bronze	0.27	0.13	0.12	0.18	0.70	0.22	0.25	1.35
	Blue	0.29	0.15	0.12	0.18	0.70	0.22	0.25	1.35
D40	Green	0.39	0.23	0.12	0.18	0.70	0.22	0.25	1.35
	Neutral	0.70	0.18	0.48	0.13	0.38	0.59	0.67	2.05
	Gold	0.39	0.40	0.21	0.43	0.36	0.29	0.33	3.15
L60	Gold	0.39	0.40	0.21	0.43	0.36	0.29	0.33	3.15
L45	Neutral	0.68	0.13	0.48	0.17	0.35	0.56	0.64	3.15
L40	Neutral	0.74	0.13	0.50	0.10	0.40	0.59	0.68	3.10



Installation of 'Datastop' in an internal screen to a control room in a water treatment plant.

CONSTRUCTION OF A SCREENED OFFICE

A normal office requires not only a shielded window to convert it into a screened room, but consideration must also be given to screening the walls, doors and roof depending on the level of screening required. The electromagnetic shielding of a conventional office was carried out at the Building Research Establishment. These windows were shielded by the installation of PILKINGTON DATASTOP D60. The walls, floor and ceiling were shielded by specially designed materials to produce an unobtrusive effect. The whole installation was carried out by SOVEREIGN ELECTRONICS. The resulting office had an appearance typical of a modern refurbishment.

The shielding effectiveness of the whole office in general, and the windows in particular, was tested in two methods by separate independent bodies - the Electrical Research Establishment (ERA) and CommsAudit.

The ERA test - a quantitative set of comprehensive measurements in the frequency range 10 MHz to 10 GHz - revealed attenuation figures in the range 40 to 70 dB. Performance in the range 1 to 5 GHz - the radar zone' - was in excess of 60 dB. Tests carried out by CommsAudit using "state of the art" equipment to decipher and read a known radiating computer, showed the office to be secure even when the receiving aerial was sited immediately outside the window. CommsAudit stated that this office was "... an excellent example of a screened room...

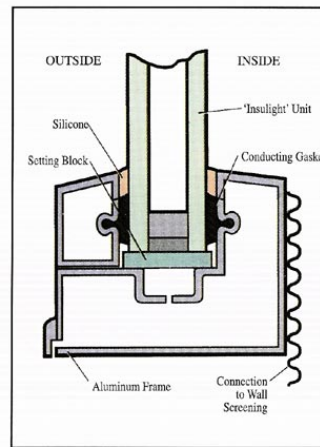


Figure 6. Typical Drained Glazing System

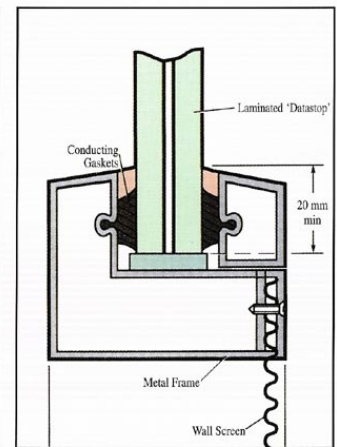


Figure 7. Typical Internal Screening (also suitable for secondary sash applications)

IMPORTANT NOTES

This publication gives a general description of the product and materials. It is the responsibility of the user to ensure that their use is appropriate for any particular application and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements.

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The Registry Building at the FAA Mike Monroney Aeronautical Centre, Oklahoma City, USA. Architect: Frankfurt Short Bruza. Datastop installed to protect computerized records from nearby radar system.